Atmos. Chem. Phys. Discuss.,
doi:10.5194/acp-2016-996-RC2, 2016

Atmospheric Chemistry and Physics Discussions
Open Access

Interactive comment on "An Atlantic streamer in stratospheric ozone observations and SD-WACCM simulation data" *by* Klemens Hocke et al.

Anonymous Referee #1

Received and published: 28 December 2016

The manuscript presents a case study of an Atlantic streamer, which was observed by MLS and ground based remote sensing measurements of ozone and simulated in a specified dynamics WACCM model run. The study is well written and fits the scope of ACP. Although it does not seem very remarkably to me that such a streamer can be observed and modeled, there are not many detailed descriptions of such events in the literature, yet. Therefore the manuscript represents a substantial contribution to the scientific progress. Major points

My major concern is, how the temporal and spatial sampling of the different data sets is treated and discussed:

1) Temporal sampling of MLS and SD-WACCM data

From the description of the model and MLS data I don't understand what data for a

certain date (as shown in Fig. 3) actually means?

MLS is on a sun synchronous orbit but can measure both night and day, so within one day there are usually measurements with small spatial difference but with 12h temporal difference. Do you take both night and day measurements into account? Considering the movement of the streamer shown in Fig. 3 I could imagine, that this can contribute to the less clear appearance of the streamer in the MLS data? Maybe it is better to use only one of them?

What is one day for the SD-WACCM data? Usually models run on smaller time steps (but probably do not save the data at each model time steps) – is one date as shown in Fig. 3 one certain time (e.g. 00:00 or 12:00 UTC)? Or an average over all/certain times of one day? For some models, there exist data which are actually sampled to correspond to the measurement times of satellites, see e.g. Joeckel et al., 2010. If such a data set exists for SD-WACCM and MLS this would be ideal to identify to what extend the differences are caused by the sampling.

2) Spatial sampling of the MLS data

On page 4 line 26, page 5 line 14/15 and page 6 line 3 and you underline the issue with the horizontal resolution (about 200km) of the limb sounding data from MLS. This can cause problems to resolve structures but I would assume that the horizontal sampling (about 165km if all profiles are valid) has a similar effect? As mentioned on page 4 line 26 also the temporal resolution (see (1)) can play a role?

3) Selection of a height or pressure level for comparison

For one location one can chose the "nearest neighbor " pressure level to one altitude as described on page 5 line 8, but for a larger region this can cause differences. In Fig. 3 there is a higher zonal O3 gradient in the MLS data, maybe this is caused by using pressure instead of height in km? I think it would be better for Fig. 3 and 5/6 to use the same vertical coordinate. (For MLS there is a geopotential height field which could be used to calculated geometric height and for model data pressure should be available as well?)

Minor points

Section 2.2

Filtering of the MLS data: together with the MLS Level 2 data sets usually a manual is distributed, how valid data should be selected. Since the authors write they use “all valid ozone profiles” I assume that these criteria were applied? For ozone and for water vapour (as far as I remember the data there could be different profiles valid for water vapour than for ozone)? I think it would be good if these criteria are explained or at least that the data quality document (Livesey et al., 2016) is cited.

Choice of the figures

I think there is to much redundant information in Figure 4 and 5b. Therefore I would suggest to combine 5b and 4 into one to make it clear that 4 is a zoom into 5b. At the same time I think it would be better to combine Figure 5a and 6 into one to make it easier for the reader to compare them.

Literature

Jöckel, P., Kerkweg, A., Pozzer, A., Sander, R., Tost, H., Riede, H., Baumgaertner, A., Gromov, S., and Kern, B.: Development cycle 2 of the Modular Earth Submodel System (MESSy2), Geosci. Model Dev., 3, 717-752, doi:10.5194/gmd-3-717-2010, 2010.

Nathaniel J. Livesey, William G. Read, Paul A. Wagner, Lucien Froidevaux, Alyn Lambert, Gloria L. Manney, Luis F. Millan Valle, Hugh C. Pumphrey, Michelle L. Santee, Michael J. Schwartz, Shuhui Wang, Ryan A. Fuller, Robert F. Jarnot, Brian W. Knosp, Elmain Martinez: “Version 4.2x Level 2 data quality and description document.”, http://mls.jpl.nasa.gov/data/v4-2_data_quality_document.pdf

Interactive comment on Atmos. Chem. Phys. Discuss., doi:10.5194/acp-2016-996, 2016.